ACCOMPLISHMENTS

OF

THE MINISTRY OF THE ENVIRONMENT'S

PROVINCIAL LOTTERY RESEARCH

1977-83

JANUARY, 1983

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1983

Ontario

Ministry
of the
Environment

The Honourable
Keith C. Norton, Q.C.,
Minister

Gérard J. M. Raymond
Deputy Minister

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1983

ACCOMPLISHMENTS OF THE MINISTRY OF THE ENVIRONMENT'S PROVINCIAL LOTTERY RESEARCH

1977-83

MOE GOAL STATEMENT:

"To achieve and maintain a quality of the Environment--including air, water and land--that will protect human health and the ecosystem and will contribute to the well-being of the people of Ontario."

HAZARDOUS CONTAMINANTS
AND STANDARDS BRANCH
135 ST. CLAIR AVENUE WEST
TORONTO, ONTARIO M4V 1P5

January, 1983

Policy and Planning Branch

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Introduction

The last decade was marked by a growing concern on the part of both public and government as evidence came to light showing that public health and the natural environment were threatened by contaminants of a hazardous nature. Traditional technologies of pollution control were found to be of limited value for protection. Scientific knowledge was inadequate.

The dedication of Provincial Lottery Funds in 1977 provided the Ministry with resources to initiate a comprehensive research program towards further knowledge and new technology needed for cost-effective controls.

This Report describes the program in brief and outlines its accomplishments so far.

Financial Information

Since 1977, proceeds from the Provincial Lottery amounting to $9.0 million have been dedicated to health-oriented environmental research and to clean up health hazards caused by environmental contamination.

A total of 222 proposals has been submitted for consideration and review by the Research Advisory Committee of which 62 were selected for approval of funding by the Minister.

The employment generated by the research projects based on information contained in project applications is 86 man-years. Many additional jobs were created from the labour intensive clean-up contracts.

Technology Transfer

The research program has laid particular stress on technology transfer and utilization of research results. Annual

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conferences held over the last three years have attracted a total audience of one thousand, representing university, government, industry, private consultants and environmental groups. Ministry staff have benefited by their attendance, and new projects funded by the Ministry have resulted.

Technology transfer has also been helped by the fact that funding of a number of projects has been shared with the Ontario Ministries of Health, Labour and Agriculture, with the Federal Department of National Health and Welfare, and with several municipalities. Good contacts are likewise maintained with researchers in other regions and countries.

Annual Allocations & Expenditure of Funds

	Allocation	Expenditure
1977-78	$1,000,000	$ 724,800
1978-79	2,100,000	1,911,400
1979-80	2,700,000	2,628,300
1980-81	1,800,000	1,799,800
1981-82	900,000	899,900
1982-83	846,800	846,800 (projected)
	$9,346,800	$8,811,000

A total of $936,000 will be needed to complete projects already underway in 1983-84.

Economic Impact on Recipients of Funds

The funds have been distributed as follows:

Performed	No. of Projects	% of Total Funds
Research by Universities and Colleges	31	38.4
Research by Contractors and Consultants	19	25.4
Research by Ontario Research Foundation	3	6.8
Research by Municipalities	4	10.0
Cleanup by Contractors	4	19.4

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The following Ontario Universities have participated in this program: Lakehead, Laurentian, Western, Waterloo, Guelph, McMaster, York, Toronto and Ottawa.

Review of Projects and Accomplishments

Summary of Projects

Projects have been directed towards the solution of health-related environmental issues with a particular focus on hazardous contaminants. They are summarized in the following table:

Funding

Project Classification & Project Activity	No. of Projects	% to Total Projects	Cost X$1000	% Cost to Total
1) Cleanup of Hazardous Contaminants & Spills	4	6.5	1603.1	18
2) Research to Develop Cost Effective Technology for Improvement in:				
2a. Drinking Water	9	14.8	858.4	9.7
2b. Sewage & Sludge Treatment	9	14.8	830.9	20.6
2c. Land Construction & Operation	4	6.5	434.7	4.9
2d. Air Quality Effects on Health	7	11.5	1033.3	11.6
2e. Water Quality Effects on Health	3	4.9	39.9	0.5
Sub-total	32	52.6	4197.2	47.3
3) Research to Control Health Hazards from Contaminants				
3a. Hazardous Contaminants and their Interaction	20	32.8	2684.0	30.2
3b. Analytical Procedures	5	8.2	399.6	4.5
Sub-total	25	41.0	3083.6	34.7
TOTAL	61	100.0%	8883.9	100.0%

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Accomplishments

A. Development of Improved Methods of Cleanup of Hazardous Contaminants and Assistance towards Cleanup Operations

- Lead deposition around smelting plants (jointly with Toronto lead smelters).
- Radiation contamination of houses at Elliot Lake and Bancroft (jointly with the Federal Government).
- Identification of mine tailing sites and estimation of potential hazard.

B. Drinking Water

- Removal of hazardous contaminants by activated carbon and by improved alum treatment techniques.
- Use of ozone for disinfection without production of hazardous contaminants i.e. chloroform and other chlorinated substances.
- Improved virus identification techniques.

C. Sewage and Sludge Treatment

- Development of artificial marsh for sewage treatment (jointly with Municipality).
    - Techniques for construction of cat tail marsh treatment operation established.
    - Operational methods were established.
    - Similar facilities now being planned in small communities at significant savings over conventional systems.
- Provided data on effects of sludge on agricultural land, allowed development of new sludge disposal policy, and reduced the cost of excessive use of synthetic fertilizers.
- Demonstrated benefits of sewage effluent disinfection to downstream water users.

D. Landfill Construction and Operation

- Provided data on attenuation of metals in landfill leachate by soils.
- Provided data on methane gas migration at closed landfill sites, required in setting land use criteria.

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D. Landfill Construction and Operation (continued)

- Air quality effects on health.
- Determined the significance of road dust in air pollution.
- Pulmonary tests on children living above and below Hamilton Mountain showed significant correlation between air quality and respiratory morbidity, particularly indoor-outdoor environment.

E. Health Hazards from Contaminants

- Tested alternate PCB substitutes and demonstrated minimal environmental health effects.
- Developed improved biological testing methods for the identification of carcinogenic chemicals.
- Identified normal body burdens of Lead and Cadmium in vital body organs allowing better evaluation of abnormal levels.
- Demonstrated an alternate technique to pesticide application by the sterilization of breeding females for the control of onion maggots.
- Developed improved analytical procedures for the identification and quantification of contaminants.

Without this source of funding, these very important projects would not have been undertaken. In the absence of funding for 1983-84, MOE cannot undertake to continue and complete outstanding projects.

SUMMARIES OF INDIVIDUAL PROJECTS

1 - CLEANUP OF HAZARDOUS CONTAMINANTS AND SPILLS

Project	Title	Organization	Purpose	Lottery Funding & Duration	Status/Results
1	"Replacement of Lead Contaminanated Soil Around Three Secondary Lead Smelters."	Sheridan Nurseries, Toronto.	To replace lead contaminated soil causing a potential health hazard in populated areas.	$83,200 1977	Completed 1977. Replacement of the soil eliminated the danger.
2	"Environmental Clean-up of Inactive and Abandoned Mining Properties."	MOE	- Survey of abandoned mining locations in Ontario. - Assessment of environmental impact and health hazards. - To recommend remedial and control technology.	$94,300 1977	Completed in 1979. Report documents the nature and extent of environmental problems with recommendations for remedial measures.
7	"Radiation Control Measures in Elliot Lake."	Atomic Energy of Canada	- Reduction of radioactivity in affected properties. - Reduction of radon-causing potential health hazards in residents.	$1,206,100 1977-1980	Completed 1980. $1.3 in additional cost covered by AEC. - Remedial work included 480 residential properties. - Continued with MOE funding.

Project	Title	Organization	Purpose	Lottery Funding & Duration	Status/Results
9	"PCB Cleanup and Assessment near Dowling, Ontario."	Geocon Ltd.	Assessment of environmental impact on soil and water caused by PCB spill - CPR train accident near Dowling: PCB-soil-water interaction, and potential health hazard.	\$219,500 1977-1980	Completed in 1980. Results were used to: contain contaminated soil (concrete enclosure), protect public health, resolve the issue.

2 - RESEARCH TO DEVELOP COST EFFECTIVE TECHNOLOGY FOR IMPROVEMENT

2a Drinking Water

2b Sewage and Sludge Treatment

2c Landfill Construction and Operation

2d Air Quality Effects on Health

2e Water Quality Effects on Health

2a Drinking Water

Project	Title	Organization	Purpose	Lottery Funding & Duration	Status/Results
4	"Detection, Enumeration and Interpretation of Levels of Virus in Drinking Water and Bathing Waters."	University of Ottawa	To identify types and levels of virus in Ottawa River water sewage effluents, Brittania Beach water and water entering the Treatment Plant.	$92,600 1977-80	Completed 1980. Information gained can be used for interpretation of virus data, and in the development of Guidelines.
8	"Chloroform Reduction Investigation Program at Belleville Utilities Commission."	Belleville Utilities Commission, Gore & Storrie Ltd.	To apply laboratory-developed techniques for reduction of chloroform produced during chlorine disinfection of drinking water.	$83,900 1977-80	Completed 1980. The results will be used in the design of Belleville Water Treatment Plant.
21	"Organic Contaminants Removal from City of Brantford Drinking Water."	Brantford Public Utilities & Enviroclean Ltd.	To examine the use of activated carbon to several organic compounds from drinking water using a pilot scale treatment facility.	$37,000 1978-80	Completed 1980. The project has demonstrated the effectiveness and adaptability of the method for safe drinking water production.

2a Drinking Water (continued)

Project	Title	Organization	Purpose	Lottery Funding & Duration	Status/Results
27	"Ozone Application as an Alternative to Chlorine for Drinking Water Disinfection."	International Environ. Consultants Ltd.	To study the effectiveness of ozone treatment of drinking water as a substitute for chlorine. Cost estimates of ozonation to be made.	$214,700 1979-present	Completed 1982. Report expected. Paper presented at Technology Transfer Conference. The results are important for MOE efforts to provide safe drinking water and eliminate health hazards.
29	"Biomonitoring of Public Water Supplies."	International Environ. Consultants Ltd.	Fish from the Grand River were used to study their exposure to organic contaminants in raw water supplies.	$214,600 1979-81	Completed 1981. The use of fish to monitor drinking water was demonstrated. Direct computer analysis of data can be used as an alarm indicator for spills.
41	"Bruce Hydroelectric Thermal Plume Definition Flights."	Intertech. Remote Sensing Ltd.	To provide a synoptic view of the plume at Bruce Generating Plant relative to ambient Lake Huron temperature using low and high altitude flights.	$14,500 1979-81	Completed 1981. The study provided a continuous thermal definition of the total plume.

2a Drinking Water (continued)

Project	Title	Organization	Purpose	Lottery Funding & Duration	Status/Results
53	"A New Potable Water Treatment Method for Trihalomethane Precursor and Synthetic Organic Removal."	Zenon Environ. Enterprises Ltd.	To develop adsorbents for treatment of drinking water and study their efficiency to remove organics prior to recommending pilot plant design.	$30,000 1981-83	In progress. Funded in partnership with Health and Welfare Canada. A paper was presented. The results will complement MOE studies on safe drinking water.
62	"Investigations of Nitrate Distributions and Nitrogen Transformations in a Shallow Sandy Aquifer near Alliston, Ontario."	University of Waterloo	To study nitrate contamination of domestic well water, and develop an alternate groundwater nitrate removal procedure.	$141,100 1982-85	In progress. Reporting date is 1985. The findings will be used to reduce or eliminate the problem of nitrate contamination of domestic well water in agricultural areas of Ontario.
63	"Design of Groundwater Monitoring Programs for Waste Landfill Sites."	University of Toronto	To apply statistical methods and models to monitoring groundwater quality at various landfill sites.	$30,000 1982-85	In progress. Reporting date is 1985. This matter has been a major issue for MOE. The results will be used for monitoring groundwater quality causing public concern.

2b Sewage & Sludge Treatment

Project	Title	Organization	Purpose	Lottery Funding & Duration	Status/Results
12	"Disposal of Sewage Sludge on Agricultural Land."	University of Guelph	To determine long-term effects of sewage sludge application to agricultural land with emphasis on the quality of crops.	$304,300 1978-80	Completed in 1980. Results were used to assess the use of sewage treatment wastes as fertilizers without causing adverse effects to human health and animal.
13	"Effects of Applying Digested Sewage Sludges to Agricultural Land Lysimeter Studies."	Rush Engineering Services	- To define long-term maximum allowable sludge application rate to agricultural lands. - To compare results with Guelph field data.	$104,200 1978-81	Completed in 1981. Maximum allowable sludge application rate to farmland was determined and incorporated in Guidelines.
18	"Development of an Experimental Marsh Treatment Facility at Listowel, Ontario."	Gore & Storrie Ltd.	To establish a pilot marsh sewage treatment system at Listowel.	$335,300 1979-82	Completed in 1982. Design report prepared. The Ministry is currently using this facility to establish its efficiency and cost effectiveness for sewage treatment and further applications.

2b Sewage & Sludge Treatment (continued)

Project	Title	Organization	Purpose	Lottery Funding & Duration	Status/Results
28	"Effect of Hydraulic Characteristics and Effluent Chlorination on the Incidence of Microorganisms of Public Health Significance in Waters Receiving Sewage Treatment Plant Effluents."	Beak Consultants Ltd.	- To study the effect of chlorination on bacteria in sewage effluents. - To investigate the feasibility of using bacteria as indicators.	$278,700 1979-82	Completed in 1982. Monitoring of bacteria in effluents is now possible to protect public health. Use of bacteria to replace indicator organisms may be more efficient.
30	"Kennedy-Burnett Urban Stormwater Runoff Treatment Study." (In conjunction with Project #37). Partners: Environment Canada, Cities of Ottawa & Nepean, Municipality of Ottawa-Carleton.	Regional Municipality of Ottawa-Carleton	- To determine the efficiency of treatment of urban stormwater and to characterize the quality and quantity of urban runoff.	$100,100 1979-81	Completed in 1981. A monitoring system has been developed. The data is in support of MOE pro-impoundment treatment across the Province.
37	"Rideau River Stormwater Management Study, Ottawa, Ontario." Partners: Environment Canada, Cities of Ottawa & Nepean, Regional Municipality of Ottawa-Carleton.	Regional Municipality of Ottawa-Carleton	- To improve water quality in the drainage area of the Rideau River, that to allow for improved recreational activities and reduced health hazards.	$650,000 1979-83	In progress. Reporting date is 1983. Total cost = $1,434,000 The study will result in a comprehensive stormwater management plan for the Rideau River and potential use throughout Ontario.

2b Sewage & Sludge Treatment (continued)

Project	Title	Organization	Purpose	Lottery Funding & Duration	Status/Results
46	"Compilation of Summation Report on Nine Years of Research Studies on the Disposal of Sewage Sludge on Agricultural Land."	University of Guelph	To assess the results of field, greenhouse and laboratory studies of the application of sludges to farmland including environmental effects and trends.	$11,500	Completed in 1982. The report provides valuable information on the use of sewage sludge as fertilizer and related Canada-Ontario Agreement studies over the last nine years.
54	"Application of Ultraviolet Disinfection Technology in Ontario WPCP Effluents."	Standard Biological Laboratories Ltd.	A pilot scale UV disinfection unit will be used to establish the efficiency and performance of the method applied to sewage effluents.	$41,000 1981-83	In progress. Report is expected in 1983. The results will be used to establish UV design guidelines for disinfection of sewage treatment effluents and eliminate health hazards.
57	"Assessment of the Potential for Dissemination of Environmental Contaminants by Treatment of Waste Water in Lagoon Systems."	Limnos Ltd.	Literature and unpublished data on contaminants in sewage lagoons will be evaluated.	$5,900 1981-82	Completed in 1982. Insufficient data on the danger of transfer of contaminants in sewages to the foodchain has been noted and further studies were recommended for the protection of public health.

2c Landfill Construction and Operation

Project	Title	Organization	Purpose	Lottery Funding & Duration	Status/Results
16	"Sanitary Landfill Site Investigation at Canadian Forces Base, Camp Borden."	University of Waterloo	- To develop methods for leachate monitoring and their application to groundwater geochemistry. - To evaluate the process of anerobic decomposition using mathematical models.	$36,200 1978-80	Completed in 1980. The planned objectives were achieved. The information obtained on patterns of organic and inorganic contaminants will be valuable in MOE present landfill site identification strategy.
23	"The Study of Gas Production and Migration at Closed Landfill Sites."	Hydrology Consultants Ltd.	- To study the production and control of gas at sanitary landfills. - To establish a data base of gas migration at selected sites with emphasis on development of regulations for land use.	$252,800 1979-82	Completed in 1982. The objectives were achieved. The data obtained are valuable in setting criteria for use of land close to previous dump sites for urban development. This activity is now part of the Waste Management program in MOE.
44	"Attenuation in Groundwater of Inorganic Contaminants from Sanitary Landfills, Attenuation of Leachate."	University of Waterloo	To investigate the attenuation of contaminants in groundwater at selected landfills in North Bay and Waterloo. Contaminants profile maps will be produced.	$116,000 1979-82	Completed. Reporting date is 1983. Public concern for groundwater contamination near landfills is well known. The results, especially the contaminants maps, will provide predictive data for policy making.

2c Landfills Construction and Operation (continued)

Project	Title	Organization	Purpose	Lottery Funding & Duration	Status/Results
58	"Field Measurements Infiltration through Landfill Covers."	Gartner Lee Ltd.	To study infiltration of water through various types of cover materials used in the construction of landfill sites. Field data will be collated for one year and verified for reliability.	$29,700 1982-83	In progress. To be completed in 1983. The anticipated results will assist MOE in preventing infiltration of hazardous contaminants, possibly present in landfills, to groundwater.

2d Air Quality Effects on Health

Project	Title	Organization	Purpose	Lottery Funding & Duration	Status/Results
15	"An Investigation of the Health and Welfare Effects on Noise in Ontario."	SNC/GECO Canada Inc.	To investigate the health effects of noise at 25 selected sites near railways, highways, industry and airports using social surveys, audiological testing and health records.	$51,400 1978-79	Completed in 1980. The results are helpful in policy setting and remedial action for noise reduction in Ontario.
17	"A Study on the Relationship between Hospital Admission Rates for Acute Respiratory Illness and Air Quality in Several Ontario Cities."	University of Toronto	To correlate hospital admission for acute respiratory dieases with air pollution.	$1,000 1978-79	Completed in 1979. Air pollution data were provided by Federal and Provincial organizations.
20	"Epidemiological Study to Determine the Health Effects of Particulates and SO_2 Level (and other gases) in Air."	McMaster University	- To study the effects of indoor and outdoor air contaminants on children's pulmonary function. The survey included socio-economic factors.	$516,400 1978-81	Completed in 1981. Reported in 1982. $516,400 additional funding paid by Health & Welfare. MOH was a partner in 81/82. Children at schools, homes, hospitals, etc. in Hamilton were examined for respiratory effects of air pollutants. Significant results were obtained.

2d Air Quality Effects on Health (continued)

Project	Title	Organization	Purpose	Lottery Funding & Duration	Status/Results
32	"A Study to Evaluate Urban Road Dust as a Source of Suspended Particulates."	Ontario Research Foundation	To determine the contribution of urban dust to particulate matter concentrations in Hamilton.	$182,000 1980-82	Completed in 1982. $275,000 additional cost covered by Environment Canada, Stelco, and Dofasco. Cleaning methods assessed and cost effective urban dust control strategies developed.
40	"Effects of Ambient Air Pollution (Assessed by Personal Indoor and Outdoor Monitoring) on Humans."	Gage Institute, University of Toronto.	To assess health effects of air pollution using personal monitors for several air contaminants. 90 asthmatic and non-asthmatic cases were evaluated.	$99,500 1979-82	In progress. Completion date is 1983-84. $200,600 additional funds were granted by Health & Welfare and the U.N. World Health Organization. A portable personal monitor was developed for protection of human health. We might not be far from using them.
47	"Investigation of Sleep Disturbance Effects of Road Traffic Noise."	Wilson & Associates	To determine the relationship between road traffic noise and sleep disturbance and their effects on public health. Literature information will be reviewed and recommendations presented.	$153,000 1980-84	In progress. To be completed in 1984. The anticipated results would assist in reviewing noise criteria and possibly to reduce road noise using alternative materials for paving.

2d Air Quality Effects on Health (continued)

Project	Title	Organization	Purpose	Lottery Funding & Duration	Status/Results
56	"Controlling Sulphur Dioxide Emissions. What Are The Costs?"	University of Toronto	To examine the economics of SO_2 emission control in Sarnia or Nanticoke industrial complexes. Enforcement and abatement policies will be examined.	$30,000 1981-present	In progress 1983. Comparison between alternative pollution control enforcement policies will focus on cost effective method for SO_2 reduction.

2e Water Quality Effects on Health

Project	Title	Organization	Purpose	Lottery Funding & Duration	Status/Results
6	"The Spread of St. Louis Encephalitis through Avian & Rodent Reservoirs."	University of Toronto	To determine the role of rodents as possible virus carriers and the possibility of disease transfer by migrating birds.	$7,900	Not completed due to death of investigator. Report received in 1977. Completion of the project would assist in developing spraying programs for control of mosquitos.
45	"Continuation of Funding for the Virology Component of the University of Toronto Epidemiology Study of Bathing Beaches and Recreational Waters."	University of Toronto	To conduct epidemiological studies on illness caused by pathogens and viruses in bathing waters. Sewage Treatment Plant influent and effluents will be tested.	$17,000 1980-81	Completed 1982. In partnership with Health & Welfare Canada. The study showed that STP effluents are major sources of viruses which is under review to eliminate the health hazard.
60	"The Epidemiology of Swimming-Related Illness at Selected Conservation Areas."	University of Toronto	To determine the relationship between micro-organisms and viruses and bathing illnesses at selected conservation beaches using established virus detection procedures.	$15,000 1982-83	In progress. Reporting date is 1983. The anticipated results would assist in reviewing recreational water quality standards for the protection of public health through a Working Group in MOE.

3 - RESEARCH TO CONTROL HEALTH HAZARDS FROM CONTAMINANTS

3a Hazardous Contaminants and their Interaction

Project	Title	Organization	Purpose	Lottery Funding & Duration	Status/Results
3	"Bioaccumulation Rates, Acute and Chronic Effects of Five New Dielectric Fluids on American Flagfish."	Lakehead University	To study fish toxicity from exposure to various dielectric fluids.	$222,100 1977-80	Completed in 1980. Work done in cooperation with Ontario Hydro. Toxicity tests on fish were carried out and the use of dielectric fluids was evaluated for replacement of PCB's.
5	"An Investigation of the Environmental Health Hazards Associated with Road Oiling."	Love Associates	To test dust-suppressant material, evaluate the "Road Oil" process and its effects on soil, vegetation and aquatic life.	$134,000 1977-79	Completed in 1979. Partnership with Min. of T. & C. Waste Oils were found inefficient for dust control.
10	"Chemical Identification and Biological Assay of Airborne and Waterborne Mutagens (Carcinogens)."	York University	- To apply new sensitive bio-hazard tests to air and water samples. - To determine toxicological effects of hazardous contaminants and chemical mixtures.	$365,300 1978-80	Completed in 1980. The work involved testing of carcinogenic effects on bacterial and mammalian cells. Successful completion has resulted in the undertaking of further studies.

3a Hazardous Contaminants and their Interaction

Project	Title	Organization	Purpose	Lottery Funding & Duration	Status/Results
11	"Province-Wide Quantity/ Location Inventories and Emission/Discharge Inventories for Specified Chlorinated and Aromatic Hydrocarbons."	Acres Consultants	- To assess public exposure to hazardous contaminants. - To provide inventories of quantities, location, emissions, and discharges throughout the Province.	$173,100 1978-80	Completed in 1980. Emission discharge of 14 chemicals was below the hazard level. Continuous monitoring by MOE would ensure community safety.
14	"A Study of Atmospheric Mercury Deposition in Ontario."	Ontario Research Foundation	To collate data on mercury levels in air and estimate total deposition in Ontario. Mobile laboratory tests were carried out on site in Toronto and Huntsville.	$235,200 1978-81	Completed in 1981. No long-range transport of mercury was found. Continuous monitoring of air quality by MOE would ensure public health safety.
19	"Environmental Assessment Study on Uranium and Other Elements in Plants around Ontario Uranium Mines."	Laurentian University	To test various environmental materials for uranium contamination using newly developed analytical procedures.	$20,000 1978-80	Completed in 1980. The funding provided base-line data on uranium which indicated local source deposition. Absence of long-range transport deposition is favourable for public safety.

3a Hazardous Contaminants and their Interaction

Project	Title	Organization	Purpose	Lottery Funding & Duration	Status/Results
22	"Effects of PH on Mercury Accumulation in Fish."	J. Maclaren Ltd.	To establish the effect of acidity in mercury uptake by lake fish.	$45,500 1978-81	Completed in 1981. Environment Canada supplied test equipment. No unusual fish uptake of mercury was found that would prevent its consumption.
24	"Monitoring Fish Population in Acid Stressed Lakes of the Haliburton Region."	University of Toronto	To determine type and population of fish exposed to contaminants leached in acidic lakes.	$183,800 1978-79	Completed in 1980. Damage to aquatic biota was reported, and methods for fish rehabilitation were recommended.
25	"The Chemical Destruction of Hazardous Polychlorinated Organic Compounds: A Feasibility Study."	University of Waterloo	To examine a new method for destruction of some hazardous organic chemicals such as PCB's.	$18,100 1978-79	Completed in 1980. Laboratory experiments were successful. However, the method appears impractical for large scale destruction of PCB contaminated oils.

3a Hazardous Contaminants and their Interaction

Project	Title	Organization	Purpose	Lottery Funding & Duration	Status/Results
26	"Increased Disease Susceptibility After PCB Exposure."	McMaster University	Laboratory mice were exposed to PCB's and dioxins and the effects of exposure assessed. This has implications for the protection of human health.	$50,800 1979-81	Completed in 1981. Equal funding was paid by the Ministry of Labour. The importance of the project led to its extension; refer to Project 50.
33	"The Identification of 'Abnormal' Values of Lead and Cadmium in Autopsy Material of Occupationally Exposed Individuals."	University of Waterloo	To establish normal levels of lead and cadmium for various groups using selected autopsy tissues of females and males.	$99,000 1979-81	Completed in 1982. Normal levels of lead and cadmium due to diet, environmental and occupational exposure are controversial. The results of this study will be useful in Risk Assessment and Standard Setting.
34	"Surface Photochemistry of Pollutants."	University of Western Ontario	To establish the photochemical processes of selected hazardous chemicals in air.	$152,000 1979-81	Completed in 1982. The behavior of toxic contaminants in air, such as dioxins, etc. were studied. The project has resulted in MOE developing new organic samplers.

3a Hazardous Contaminants and their Interaction

Project	Title	Organization	Purpose	Lottery Funding & Duration	Status/Results
36	"Assessment of the Availability and Cost of Providing Off-site Third Party Liability Coverage Protection from Damage from Disposal Facilities."	G.T.G. Scott Consultants	- To determine the cost of environmental impairment insurance liability due to waste disposal sites. - To assess economic impact of obligatory insurance.	$3,300 1979-80	Completed in 1980. As reported, the economic impact of low-cost insurance to disposal facility operators was presented to MOE.
42	"Development of Non-Chemical Approaches to Pest Control (Sterile Male Onion Maggot Technique)."	University of Guelph	To construct a facility for pest control studies. 300 acres of onions in Keswick will be used for field testing.	$237,500 1980-83	In progress. Reporting date is 1984. In cooperation with M A & F and Agriculture Canada. Successful demonstrations are being made for control of pests without the use of toxic chemicals and pesticides.
43	"Phase II of an Environmental Assessment Study on Uranium and Other Elements in Lichens and Mosses from Elliot Lake, Ontario."	Laurentian University	To analyze previously collated data and relate to contaminants plant uptake. Improvement of detection sensitivity and reliability of data have been carried out.	$89,700 1979-81	Reporting date is 1982.

3a Hazardous Contaminants and their Interaction

Project	Title	Organization	Purpose	Lottery Funding & Duration	Status/Results
48	"Review of Literature and Biological Testing Protocol Required for Multiple Toxicity Evaluation Pertaining to Hazardous Organic Compounds."	Lakehead University	To carry out an extensive literature search on aquatic toxicity of hazardous contaminants.	$10,900 1980-81	Completed in 1981. The review is in use in conjunction with Project No. 49.
49	"Aquatic Toxicity Studies of Multiple Organic Compounds."	Lakehead University	To determine aquatic toxicity of selected hazardous contaminants to fish. Application to industrial organics will also be carried out.	$170,200 1980-84	In progress. Reporting date is 1984. Partially funded from Hazardous Contaminants Funds. The results will be used for setting of environmental standards and fish consumption limits.
50	"Increased Disease Susceptibility after PCB Exposure."	McMaster University	See Project No. 26.	$62,300 1981-83	In progress. Lack of funds has prevented further MOE partnership. The reduction was covered by $69,120 from MOE Hazardous Contaminants Funds. The obtained information will be extremely valuable for setting standards for environmental and occupational exposure to PCB's and dioxins.

3a Hazardous Contaminants and their Interaction

Project	Title	Organization	Purpose	Lottery Funding & Duration	Status/Results
55	"Chemical Identification and Biological Assay Studies of Environmental Mutagens, Promoters, and Inhibitors."	York University	- To determine mutagenic and carcinogenic activities of hazardous contaminants using newly developed methods. - To determine biohazards of individual and mixtures of contaminants.	$402,800 1981-84	In progress. Partially funded from the Hazardous Contaminants budget ($50,000). Completion date is 1984. This information is essential for the establishment of health hazard, risk, standards and criteria of contaminants in air, water and waste.
59	"Literature Searches Regarding the Potential Genotoxic Hazards of Specific Environmental Contaminants."	York University	To collate literature information on carcinogenicity and biohazards of hazardous contaminants possibly present in sewage, leachates, industrial wastes and drinking water.	$8,400 1982-83	To be completed in 1983. The information obtained will assist MOE in setting objectives for several studies, and would provide an awareness profile of hazardous contaminants.

3b Analytical Procedures

Project	Title	Organization	Purpose	Lottery Funding & Duration	Status/Results
31	"Characterization and Identification of Organic Substances in Drinking Water."	O.R.F.	To develop new concentration techniques for the detection of hazardous organic chemicals in drinking water.	$200,000 1979-81	Completed in 1981. Awaiting report. The levels of organic chemicals in drinking water are exceedingly low. The results are used to improve the Ministry's capabilities and to improve public confidence in MOE data.
35	"Field Evaluation of Event Precipitation Samplers for Use in the Acidic Precipitation in Ontario Study."	United Technology	To design a precipitation sampler and test its reliability.	$53,600 1979-80	Completed in 1981. Although the sampler was designed for collection of snow for acidic precipitation, its use can be extended to measure contaminants washout.
39	"The Measurement of Total Organic Chlorine in Industrial Wastes."	Zenon Enterprises	To establish analytical methods for organic chlorine in various environmental samples.	$78,800 1979-81	Completed in 1982. A paper was presented at the MOE Technology Transfer Conference. A report is expected.

Note the apparent discrepancy in pages 2 and 3.

C. J. MacFarlane

28 Jan 83

JAN 27 1983

Ontario

Ministry
of the
Environment

965-7984

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January 26, 1983

MEMORANDUM

TO: R.A.C. MEMBERS

FROM: Mr. A. Castel
Director
Policy and Planning Branch

SUBJECT: PROVINCIAL LOTTERY RESEARCH

I enclose a copy of a report on the accomplishments of the Ministry's Provincial Lottery Research Program 1977-83.

The report was prepared as part of the joint Environment - Health - Labour submission to the Treasurer, to secure a continuation of Lottery funds for research in 1983-84.

The contents of the report are a credit to the administrative and technical abilities of the Committee, and a demonstration of the Ministry's growing preparedness to deal with the new complex problems of environmental protection. I want to thank you all for your contribution.

A. Castel

enclosure

cc: Mr. G.J.M. Raymond
Mr. D. Redgrave

3b Analytical Procedures

Project	Title	Organization	Purpose	Lottery Funding & Duration	Status/Results
61	"Development of a Methodology for the Concentration and Detection of Rotaviruses and Hepatitis A Virus in Environmental Samples."	University of Toronto	To develop sensitive methods for the detection of viruses in sewage effluent and surface water.	$49,000 1982-83	In progress. Reporting date is 1983. The information obtained will be used to assess the efficiency of Ontario Sewage Treatment Plant operation for the protection of the public from virus infections.
64	"The Development of a Freshwater Fish Test to Identify Aquatic Toxic Contaminants."	University of Guelph	To develop methods for genotoxicity testing of fish caused by aquatic contaminants.	$18,200 1982-84	In progress. Completion date is 1984-85. This project is the subject of an M.Sc. study. The developed state-of-the-art test will be used to evaluate the aquatic toxocity of hazardous chemicals.